



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,048	06/25/2003	Ju-Cheol Shin	5649-1122	3807

20792 7590 11/08/2004

MYERS BIGEL SIBLEY & SAJOVEC  
PO BOX 37428  
RALEIGH, NC 27627

EXAMINER

WEISS, HOWARD

ART UNIT PAPER NUMBER

2814

DATE MAILED: 11/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/606,048

Applicant(s)

SHIN ET AL.

Examiner

Howard Weiss

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,5 and 7-12 ~~is/are~~ are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,5 and 7-12 ~~is/are~~ are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Attorney's Docket Number: 5649-1122

Filing Date: 6/25/03

Continuing Data: none

Claimed Foreign Priority Date: 6/26/02 (KRX)

Applicant(s): Shin et al. (Lee, Park, Park)

Examiner: Howard Weiss

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1 to 3, 5 and 7 to 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art Figure 1, Kim et. al. (U.S. Patent Application No. 2002/0041030) and Lee et al. (U.S. Patent No. 5,563,448).

Admitted Prior Art Figure 1 shows most aspects of the instant invention including:

- a substrate **2**
- a first insulating layer **20** and a first hole **20** passing through said first insulating layer having sidewalls and a floor directly on said substrate

- a first conductive contact **30** comprising barrier layer **26** and a first tungsten conductive layer **28** said first conductive contact extending **32b** onto said first insulating layer outside said first hole
- a second insulating layer **36** with a second hole **54**
- a second conductive contact **60** comprising a second barrier layer **56** and a second tungsten conductive layer **58** and extending **62** onto said second insulating layer
- a third hole **22** with a third conductive contact **29** with a third barrier layer **26** and conductive layer **28** and extending **32a** onto said first insulating layer
- fourth and fifth holes **40** with a fourth conductive contact **42**
- a sixth hole **54** through a third insulating layer **50**

Admitted Prior Art Figure 1 does not show the barrier layers consisting of titanium and/or titanium nitride, a groove in said first conductive contact, the second conductive contact filling said groove and the first barrier layer extending onto the first insulating layer outside the first hole.

Kim et al. teach (e.g. Figures 2 and 3) to make barrier layers **414**, **420** consisting of titanium and/or titanium nitride, to put a groove **317** in a first conductive contact **414a**, **416a** and filling said groove with a second conductive contact **421a** to suppress separation of the conductive layer from the insulating layer and lower plugs (Paragraph **[0009]**). It would have been obvious to a person of ordinary skill in the art at the time of invention to make barrier layers consisting of titanium and/or titanium nitride, to put a groove in a first conductive contact and filling said groove with a second conductive contact as taught by Kim et al. in the device of Admitted Prior Art Figure 1 to suppress separation of the conductive layer from the insulating layer and lower plugs.

Lee et al. teach (e.g. Figure 1) to extend a first barrier layer **7** onto a first insulating layer **5** and outside a first hole to prevent metal or silicon electromigration (Column 1

Lines 55 to 59). It would have been obvious to a person of ordinary skill in the art at the time of invention to extend a first barrier layer onto a first insulating layer and outside a first hole as taught by Lee et al. in the device of Admitted Prior Art Figure 1 to prevent metal or silicon electromigration.

### ***Response to Arguments***

3. Applicant's arguments with respect to claims 1 to 3, 5 and 7 to 12 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Paper copies of cited U.S. patents and U.S. patent application publications will cease to be mailed to applicants with Office actions as of June 2004. Paper copies of foreign patents and non-patent literature will continue to be included with office actions. These cited U.S. patents and patent application publications are available for download via the Office's PAIR. As an alternate source, all U.S. patents and patent application publications are available on the USPTO web site

Art Unit: 2814

([www.uspto.gov](http://www.uspto.gov)), from the Office of Public Records and from commercial sources. Applicants are referred to the Electronic Business Center (EBC) at <http://www.uspto.gov/ebc/index.html> or 1-866-217-9197 for information on this policy. Requests to restart a period for response due to a missing U.S. patent or patent application publications will not be granted.

6. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 872-9306**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(571) 272-1720** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.
8. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/774	thru 11/1/04
Other Documentation: none	
Electronic Database(s): EAST	thru 11/1/04

HW/hw  
2 November 2004

Howard Weiss  
Examiner  
Art Unit 2814

LONG PHAM  
EXAMINER